NOAA-20 VIIRS EDR IMAGERY/NCC

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VIIRS EDR Imagery Team
(with contributions from other Imagery Team members)
2018-08-29

Outline

- Cal/Val Team Members
- Sensor/Algorithm Overview
- S-NPP/N-20 Product(s) Performance
- Major Issues and Mitigation
- Milestones and Deliverables
- Future Plans/Improvements

Imagery Cal/Val Team Members/Major Contributors

Name	Organization	Major Task
Don Hillger	**NESDIS/StAR**	Imagery Product Lead
Tom Kopp	**Aerospace**	Imagery Cal/Val Lead
Curtis Seaman	**CIRA**	Imagery/DNB expert
Steven Miller	**CIRA**	DNB/Imagery expert
Jorel Torres	**CIRA**	JPSS Liaison / trainer
Steve Finley	**CIRA**	IT/data expert
William Straka III	**CIMSS/SSEC**	Imagery/DNB expert
Rosalie Marley	**GST**	Imagery JAM
Chris Elvidge	**NCEI-Boulder**	Operational DNB products online
Arunas Kuciauskas	**NRL-Monterey**	VIIRS Online (for Naval use in particular)
Eric Stevens, Melissa Kreller, Carl Dierking, Nate Eckstein, Jay Cable	**Alaska: GINA and NWS**	NWS (use in analysis and forecasting)
John Evans, John Paquette	**NWS**	AWIPS ingest and display

VIIRS Environmental Data Record (EDR)s

VIIRS Band	Central Wavelength (µm)	Bandwidth (µm)	Wavelength Range (µm)	Band Explanation	Spatial Resolution (m) @ nadir
M1	0.412	0.02	0.402 - 0.422	Visible	750 m
M2	0.445	0.018	0.436 - 0.454		
M3	0.488	0.02	0.478 - 0.488		
M4	0.555	0.02	0.545 - 0.565		
M5	0.672	0.02	0.662 - 0.682		
M6	0.746	0.015	0.739 - 0.754	Near IR	
M7	0.865	0.039	0.846 - 0.885		
M8	1.240	0.020	1.23 - 1.25	Shortwave IR	
M9	1.378	0.015	1.371 - 1.386		
M10	1.61	0.06	1.58 - 1.64		
M11	2.25	0.05	2.23 - 2.28		
M12	3.7	0.18	3.61 - 3.79	Medium-wave IR	
M13	4.05	0.155	3.97 - 4.13		
M14	8.55	0.3	8.4 - 8.7	Longwave IR	
M15	10.763	1.0	10.26 - 11.26		
M16	12.013	0.95	11.54 - 12.49		
DNB / NCC	0.7	0.4	0.5 - 0.9	Visible	750 m across full scan
I1	0.64	0.08	0.6 - 0.68	Visible	375 m
I2	0.865	0.039	0.85 - 0.88	Near IR	
I3	1.61	0.06	1.58 - 1.64	Shortwave IR	
I4	3.74	0.38	3.55 - 3.93	Medium-wave IR	
I5	11.45	1.9	10.5 - 12.4	Longwave IR	

M-bands EDRs are highlighted in pale yellow, in addition to I-band EDRs.
True-color component bands are highlighted in red, green, and blue.

Requirements (continued)

The **Imagery** product consists of:

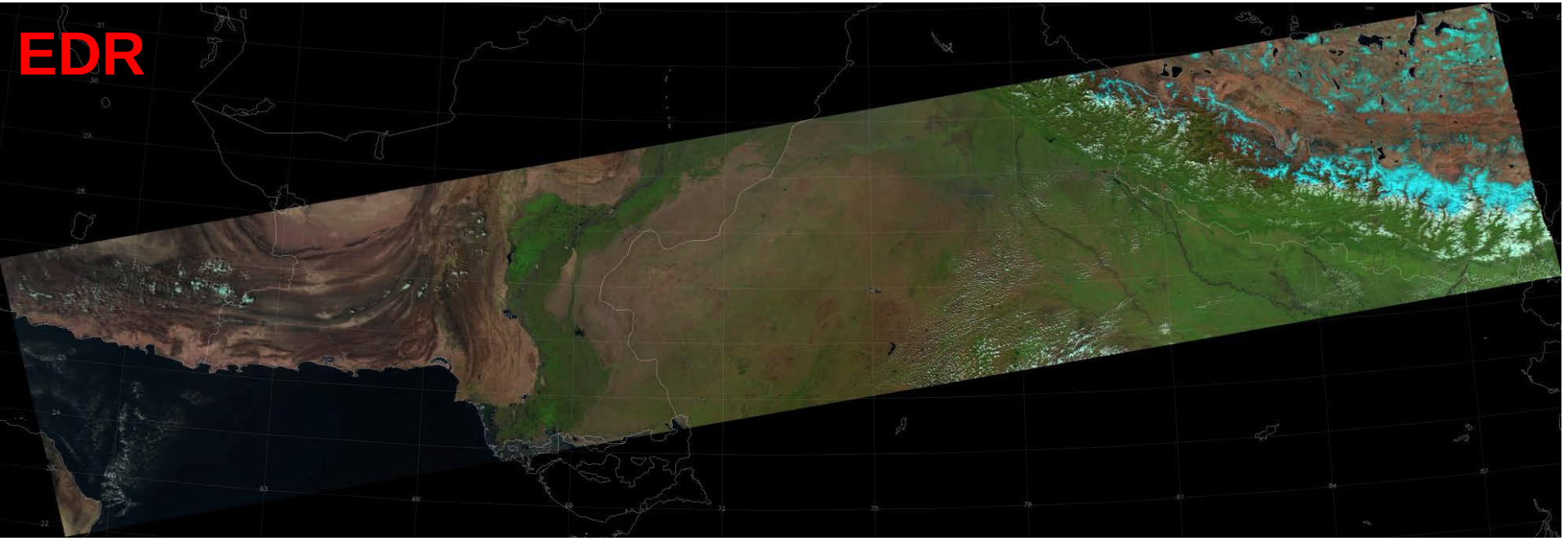
- **Visible/IR radiances/reflectances** remapped to the **Ground Track Mercator (GTM**) grid, eliminating overlapping pixels and bowtie deletions.
  - I-band and M-band Imagery
- **NCC Imagery** that is a **pseudo-albedo** derived from the DNB, creating an image product that removes large contrasts in DNB from day to night across the terminator.

Imagery is a Key Performance Parameter (KPP)

VIIRS Imagery EDR for (8) bands I1, I3, I4, I5, M14, M15, M16, and DNB for latitudes greater than 60°N in the Alaskan region (I3 and DNB bands added post SNPP launch)

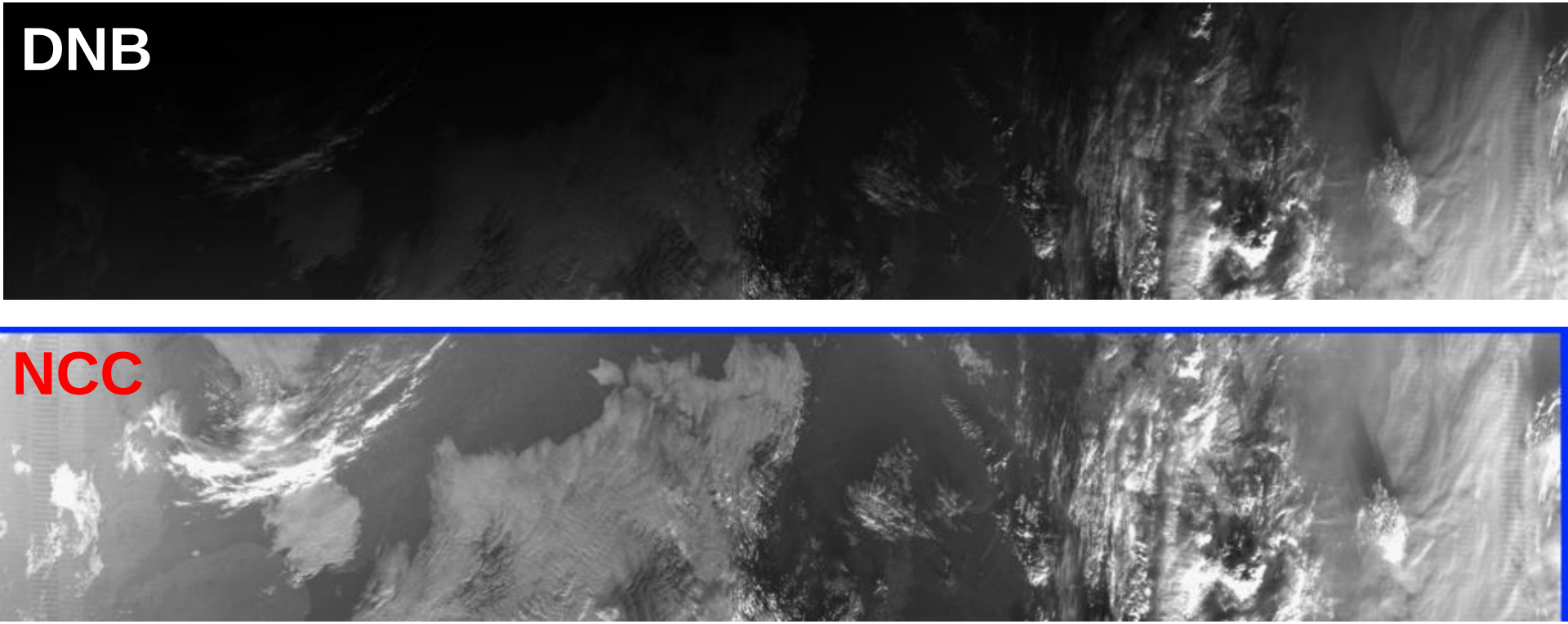
- There are **no (quantitative) Imagery requirements** that address the **quality** of the Imagery products.
- **Imagery users** decide if the quality is acceptable, therefore **including the users is a key consideration**

VIIRS SDR vs. EDR



Near Constant Contrast (NCC) vs. Day-Night Band (DNB)

Example of NCC vs. DNB for a day/night terminator (non-lunar) case. NCC extends constant contrast into the twilight portion of the granule swath.



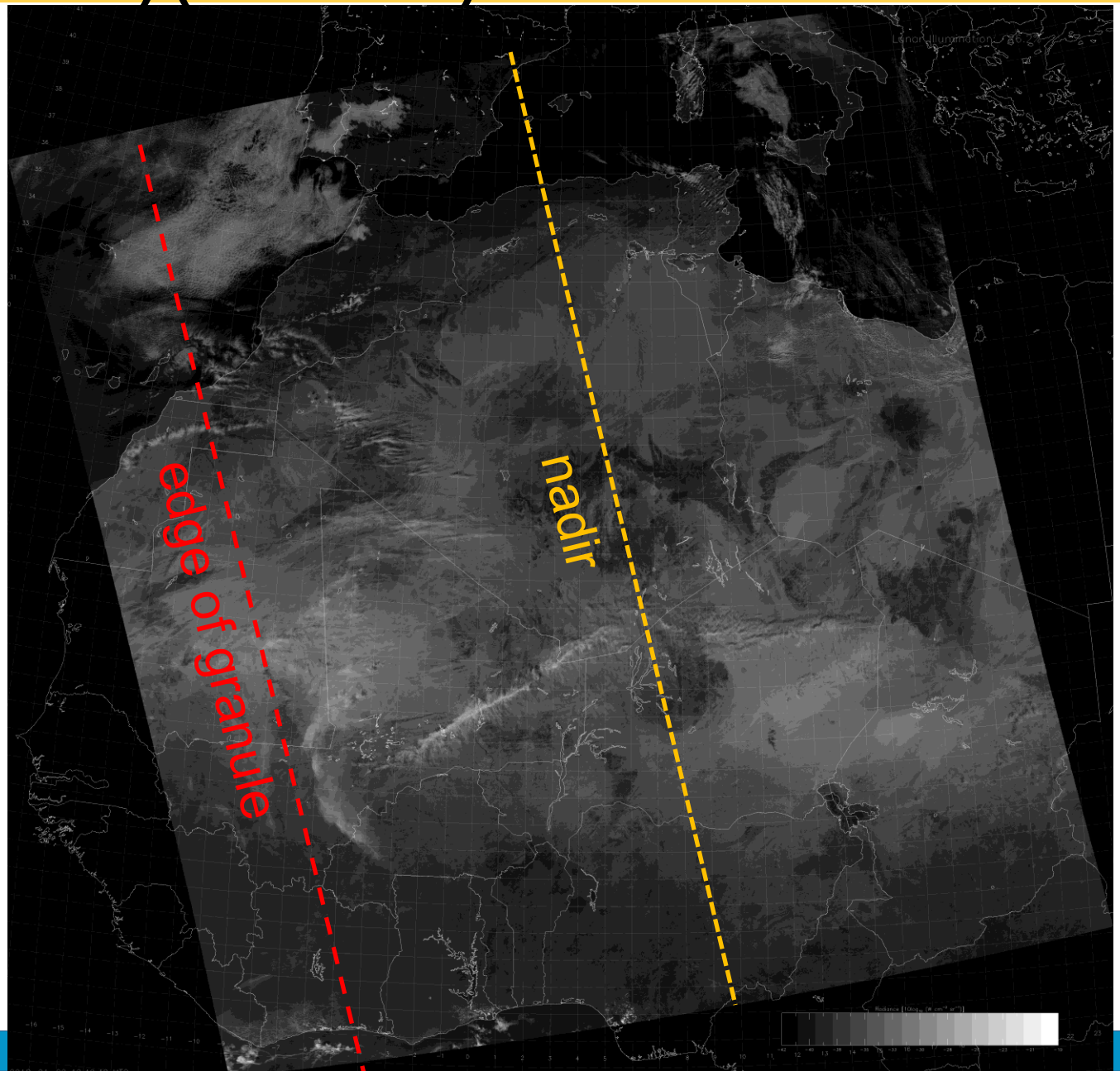
Curtis Seaman, CIRA

Findings/Issues at Validation Reviews

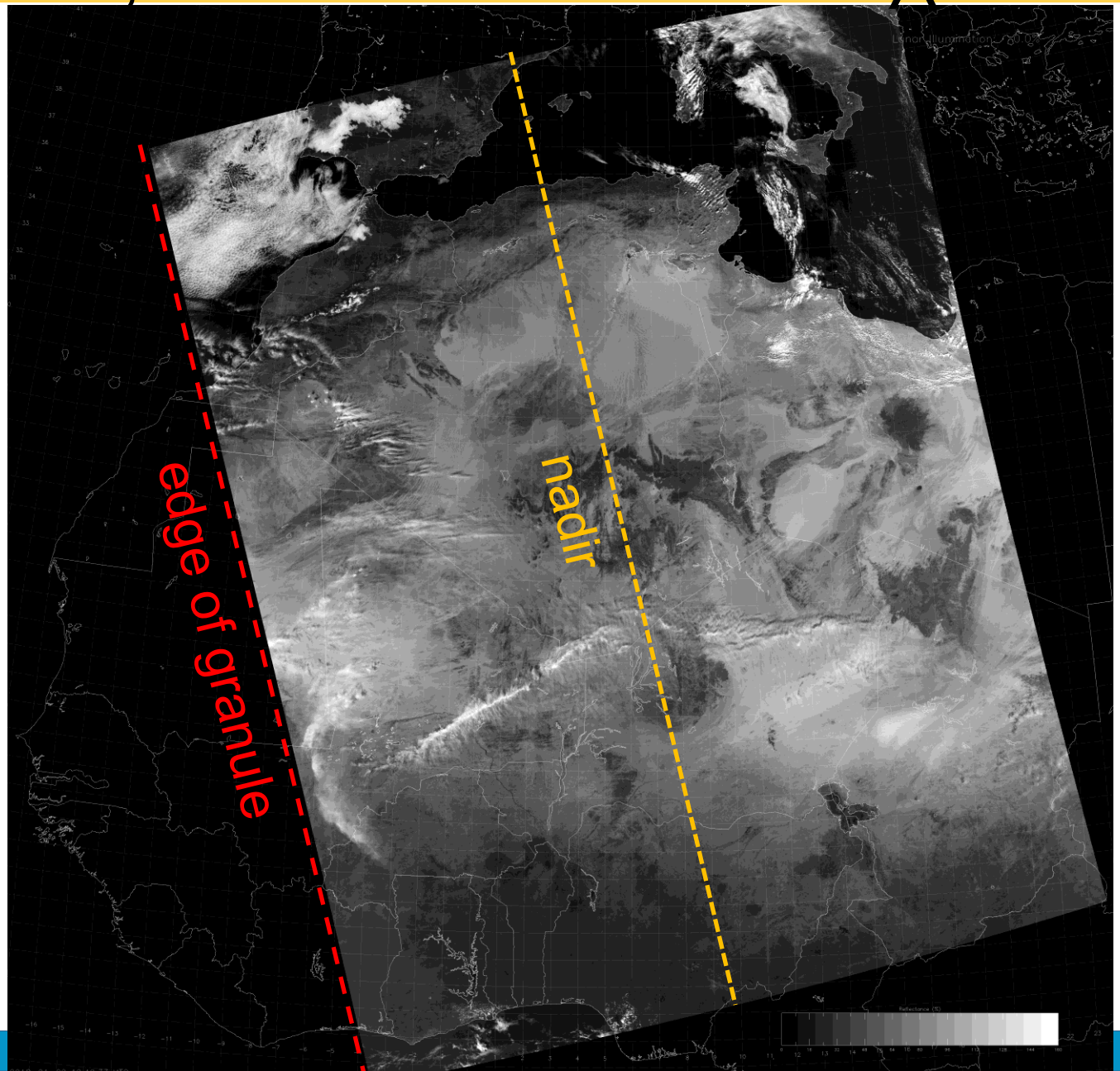
- VIIRS **M-bands** (all good) – vis/IR bands
- VIIRS **I-bands i**ssues at **Beta** that were resolved,
  - **I3 bad detector**
  - **I4 and I5 fill values**
- VIIRS **DNB/NCC** issues:
  - **Extended DNB granule processing** by NCC is working
  - **Geolocation issues** (resolved with LUT updates)
  - **Stray light (VIIRS SDR Team)**
- **Better together: NOAA-20 and SNPP** (50 min half-orbit separation examples)
- **NOAA-20 VIIRS Imagery display (I-bands, M-bands, and DNB/NCC)**
  - **http://rammb.cira.colostate.edu/ramsdis/online/noaa-20_viirs.asp**

NOAA-20 DNB extended granule

DNB (extended granule on left and nadir not at center) (2018-01-22)

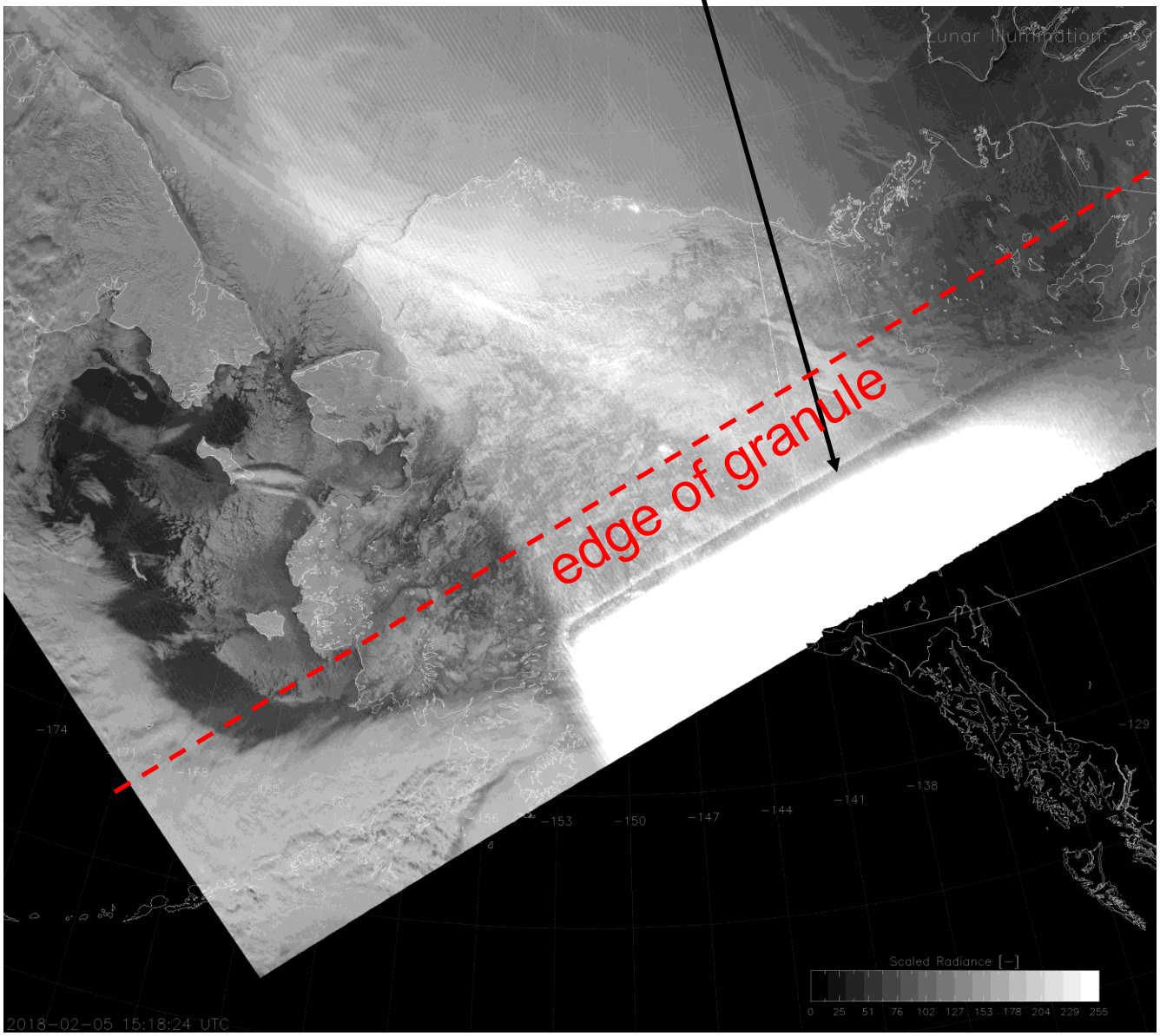


NCC (extended granule not included, and nadir at center, and better contrast than DNB) (2018-01-22)

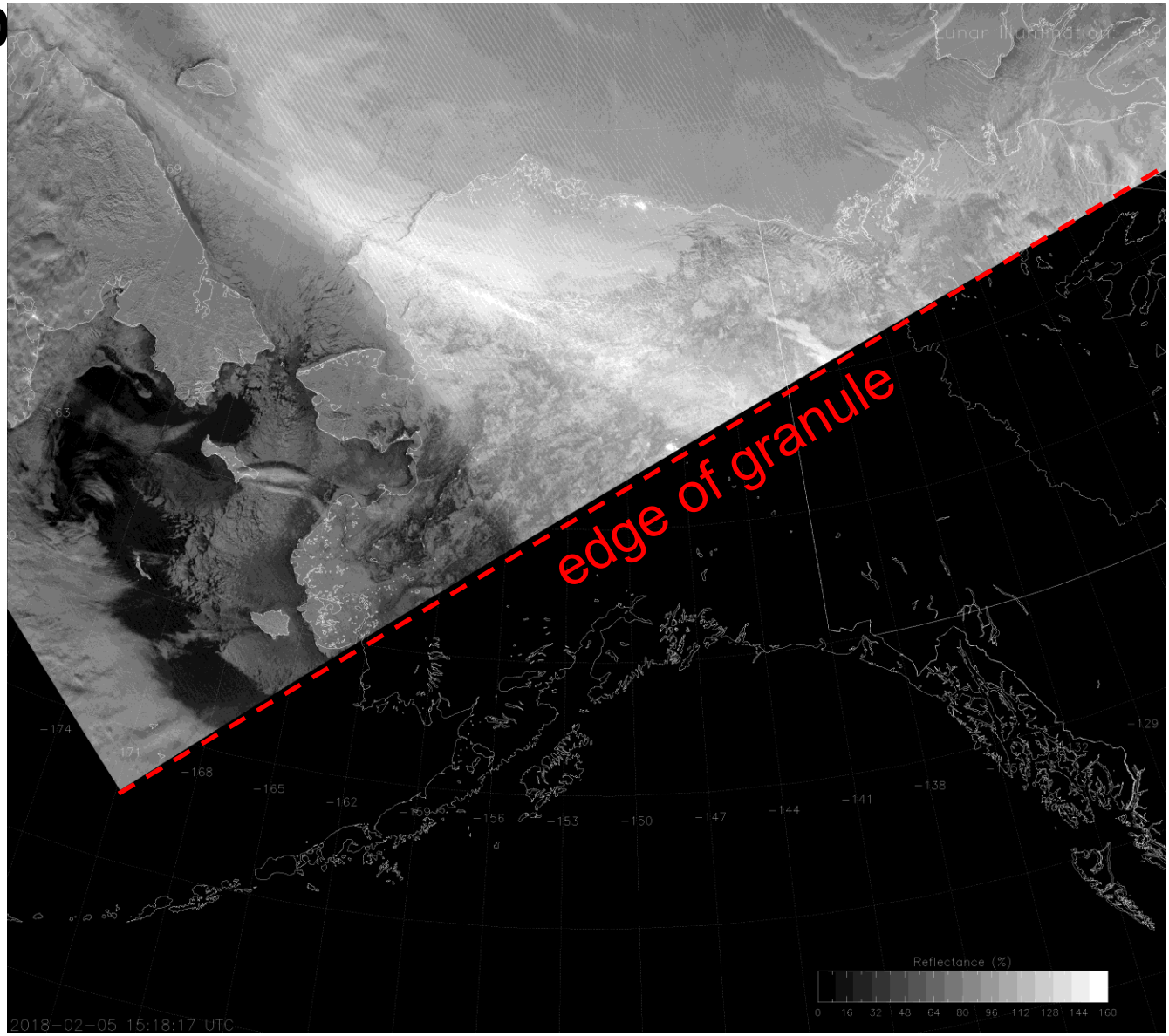


NOAA-20 DNB stray light

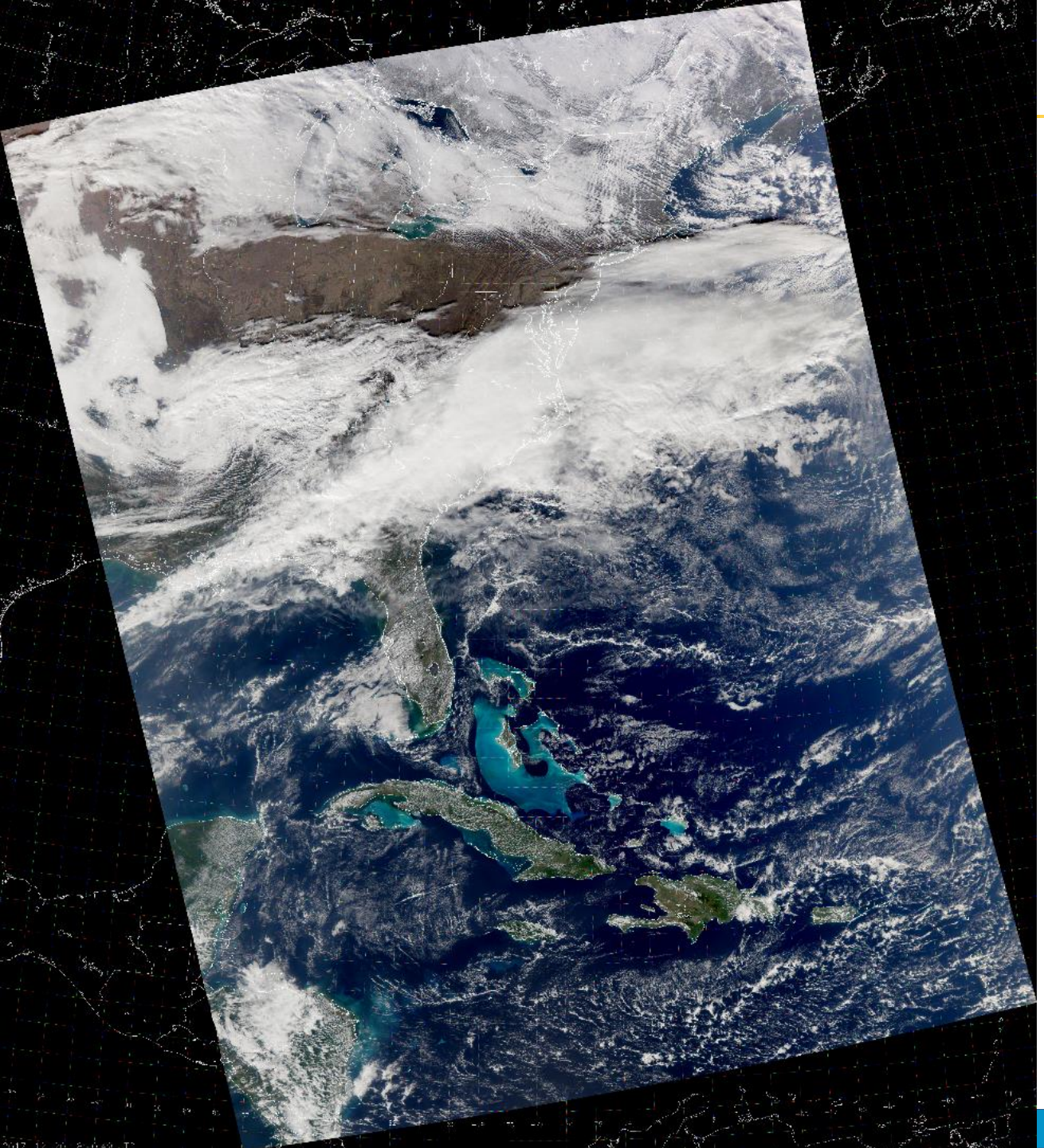
Extra strong patch of stray light in extended DNB granule (2018-02-05)



Extra strong patch of stray light not in NCC granule which cuts off extended portion of DNB (2018-02-0



NOAA-20 M-bands visible/IR bands



VIIRS True Color

Eastern US (2017-12-20)

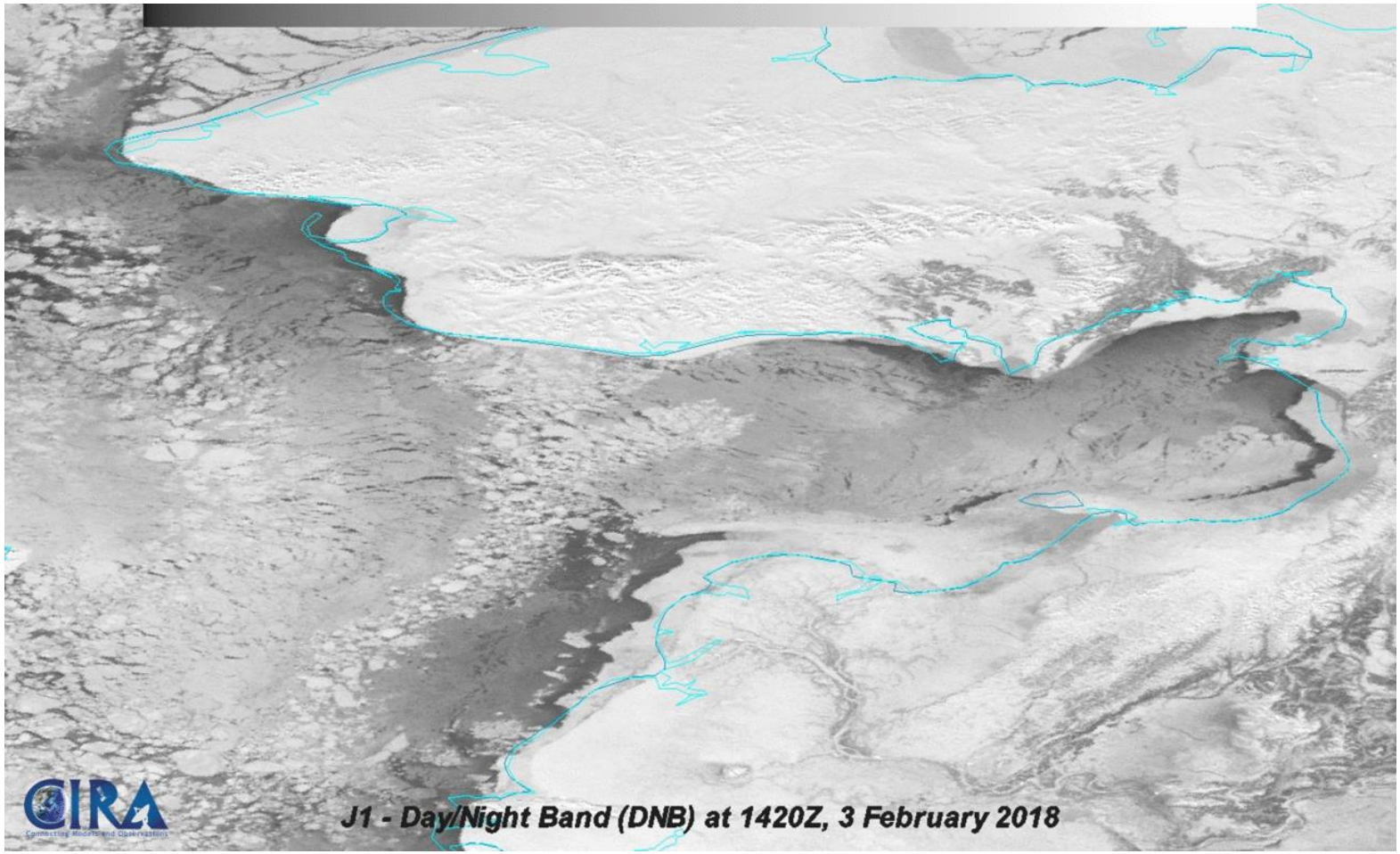
(C. Seaman, CIRA)

Day-Night-Band First Light CONUS (2017-12-14)

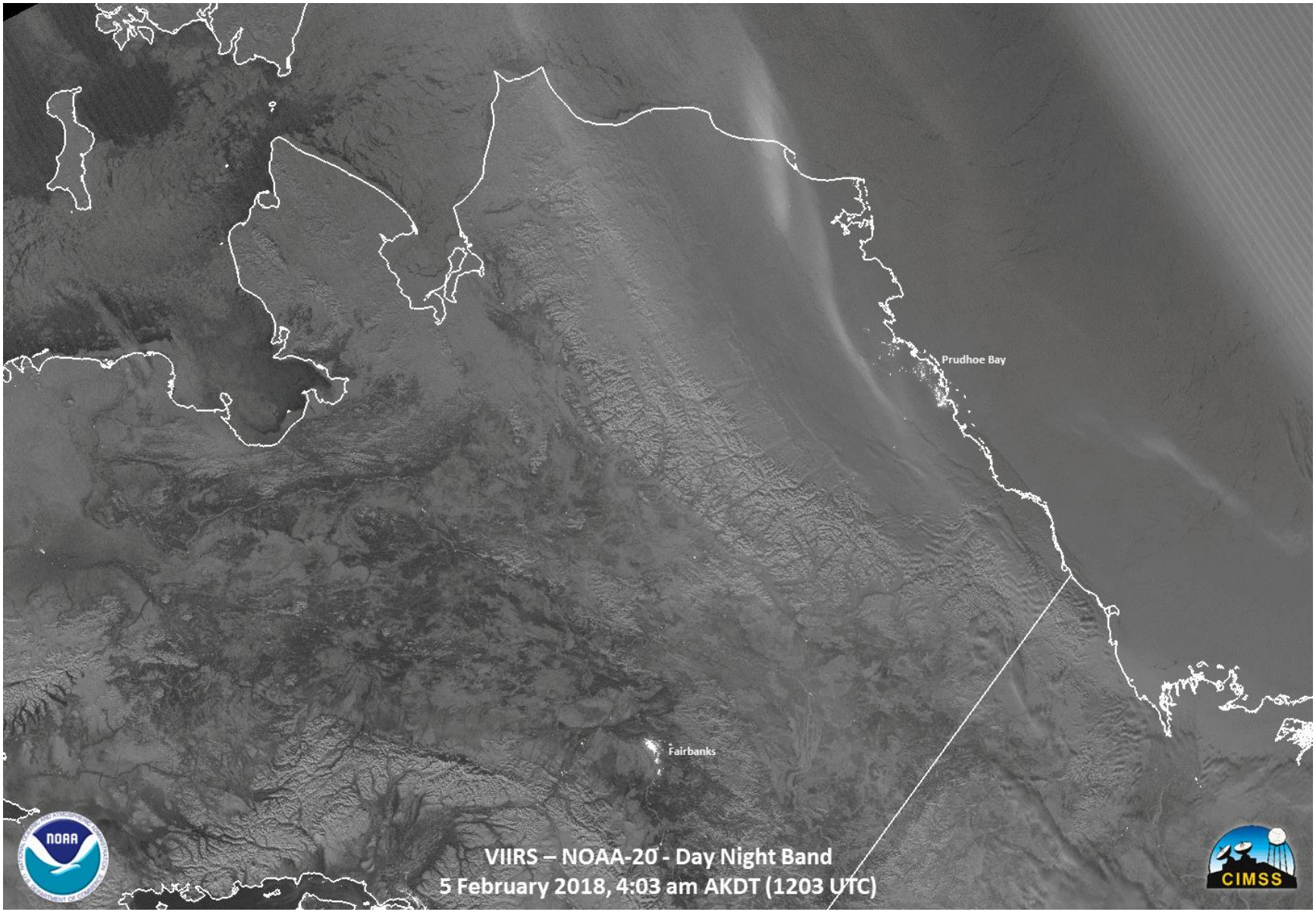
(S. Miller, CIRA; NOAA Facebook)

SNPP and NOAA-20 DNB comparisons (~50 minutes separation)

NOAA-20 DNB animation shows NW Alaska (near Nome, AK) of snow-covered areas, sea-ice edges and sea-ice motion over a period of 3 days: 3-5 February 2018. (J. Torres, CIRA)

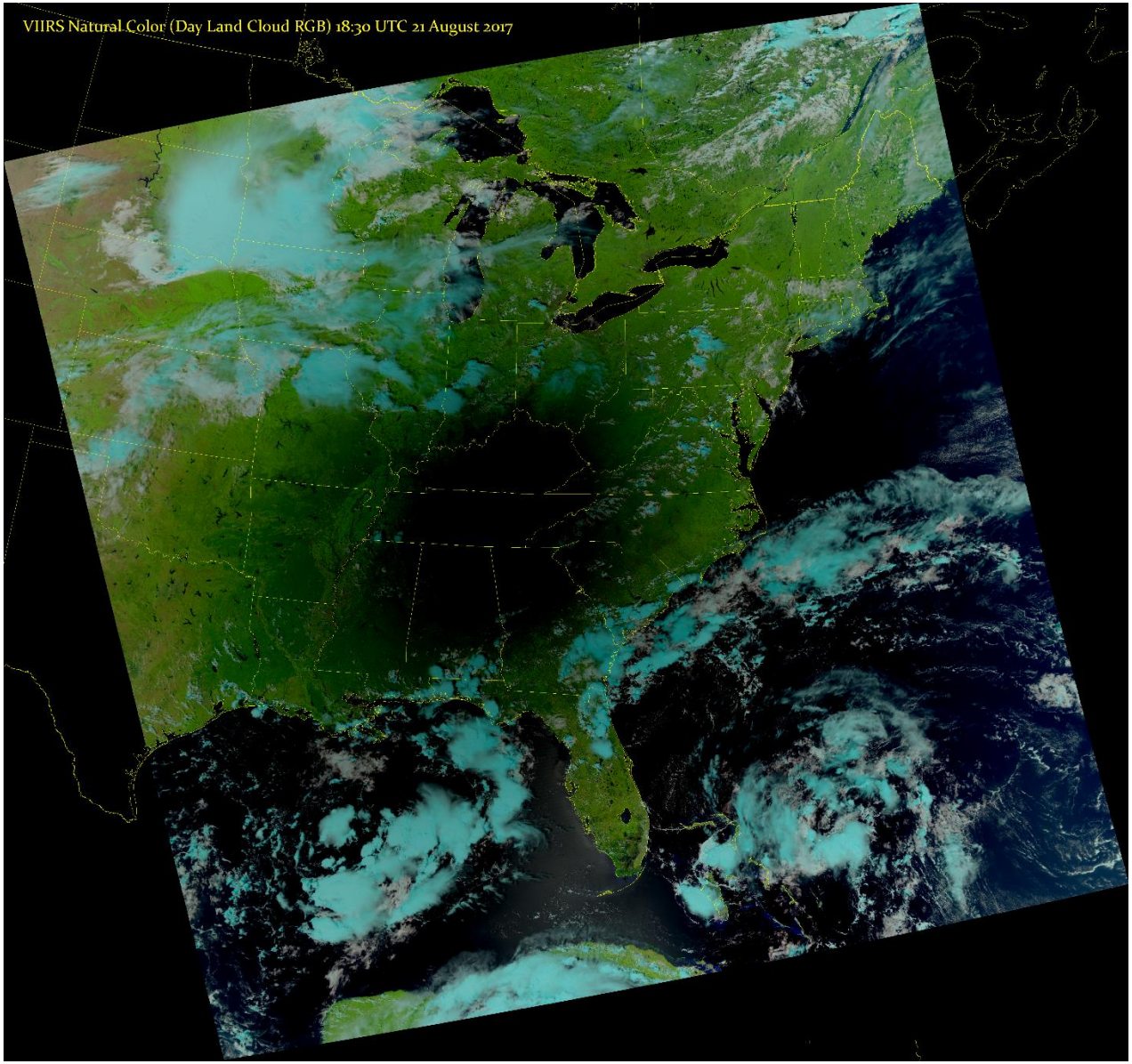


NOAA-20/SNPP DNB animation of aurora – note how quickly the light show changes! (W. Straka, CIMSS/SSEC)

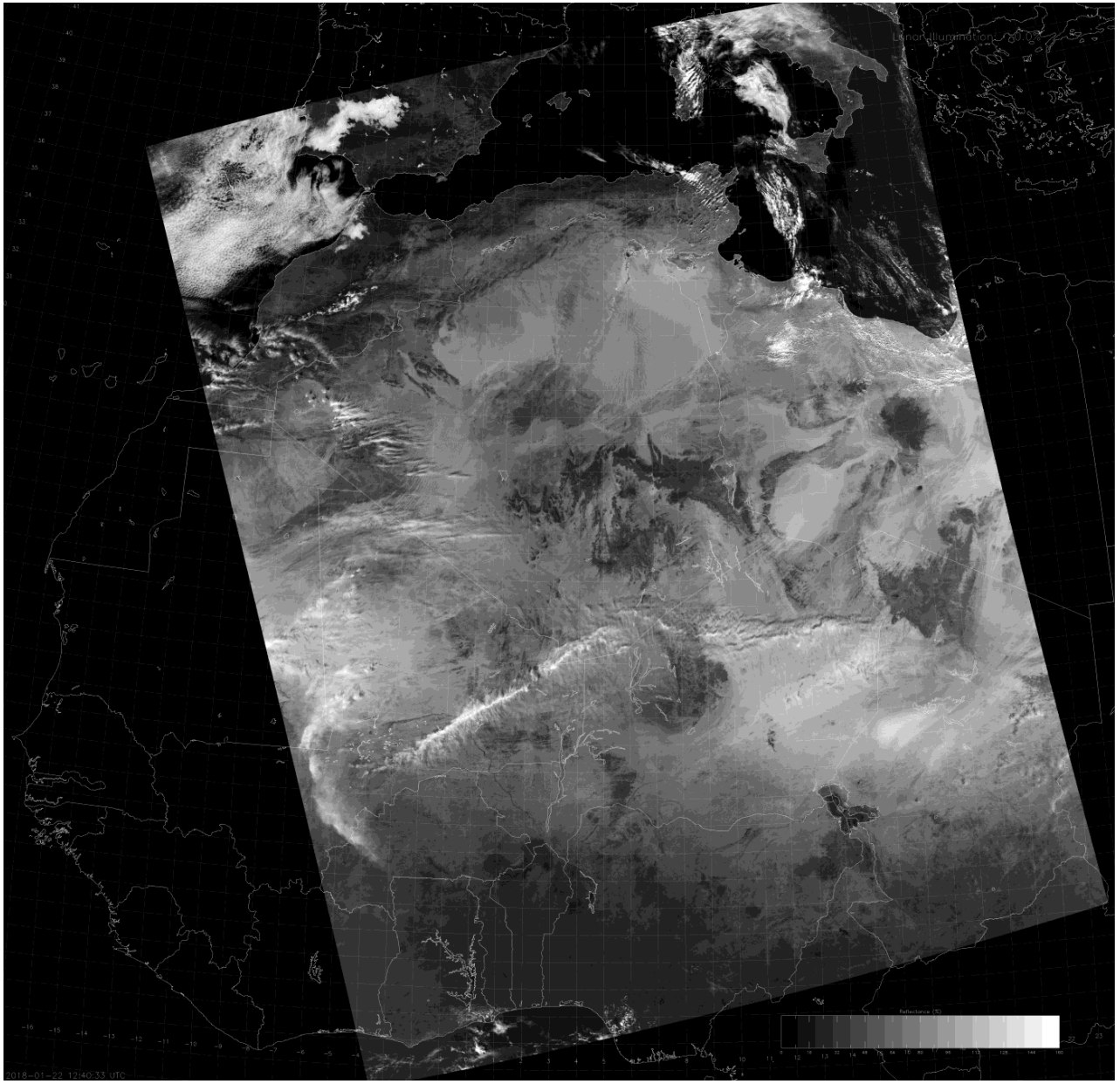


More examples

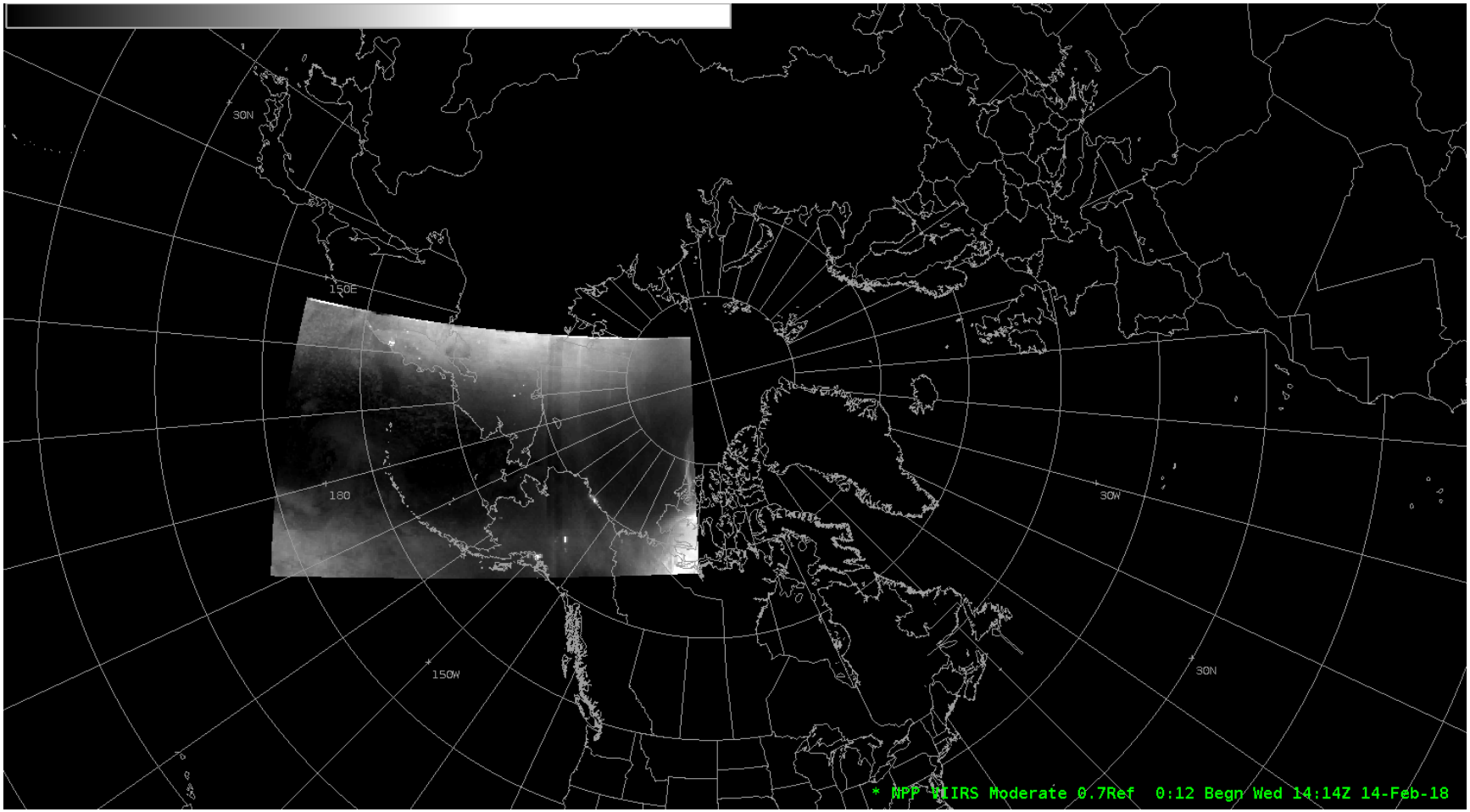
Total Eclipse – 2017-08-21 @ 1827 UTC (C. Seaman)



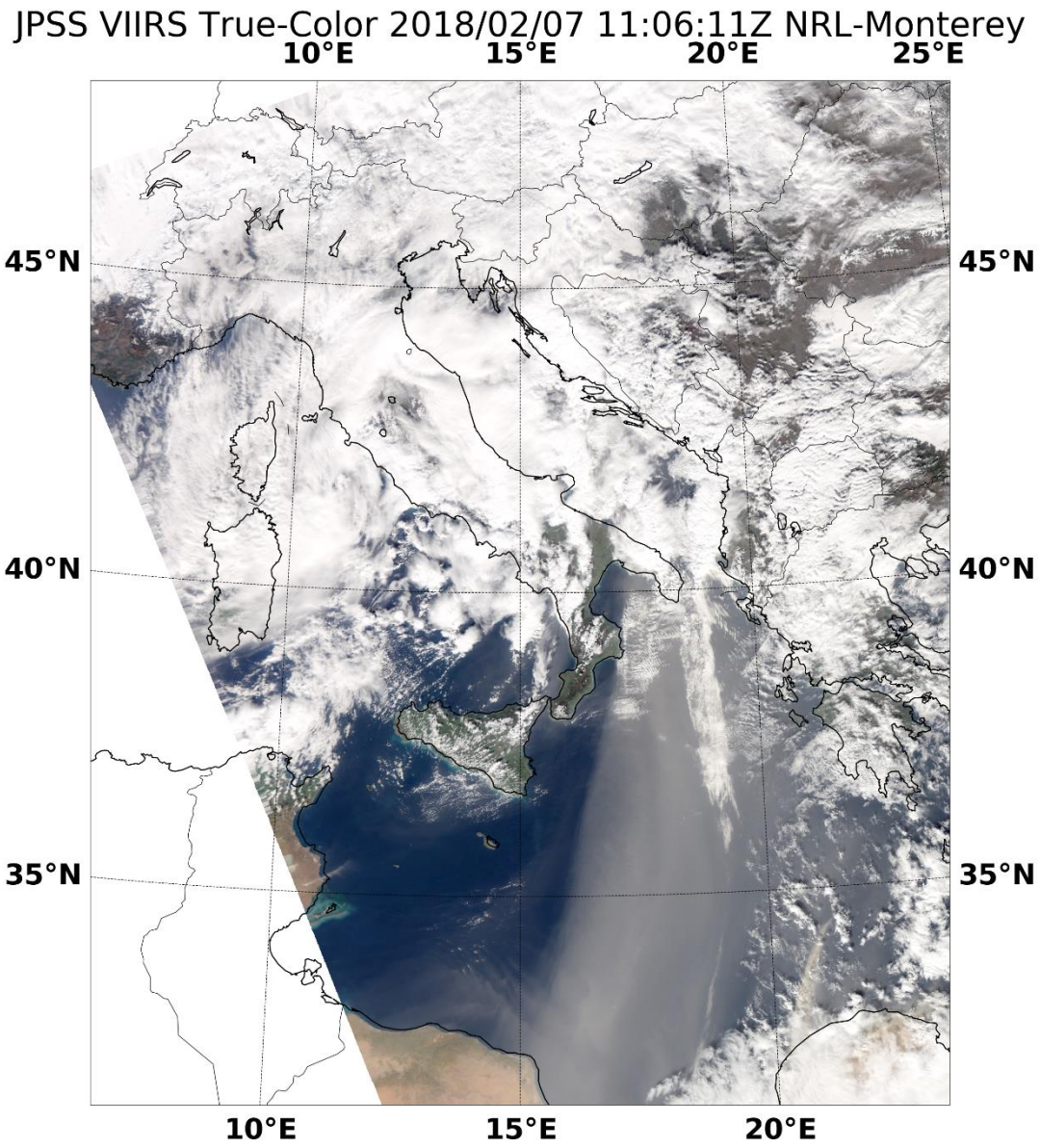
NCC 2018-01-22 @ 1240 UTC



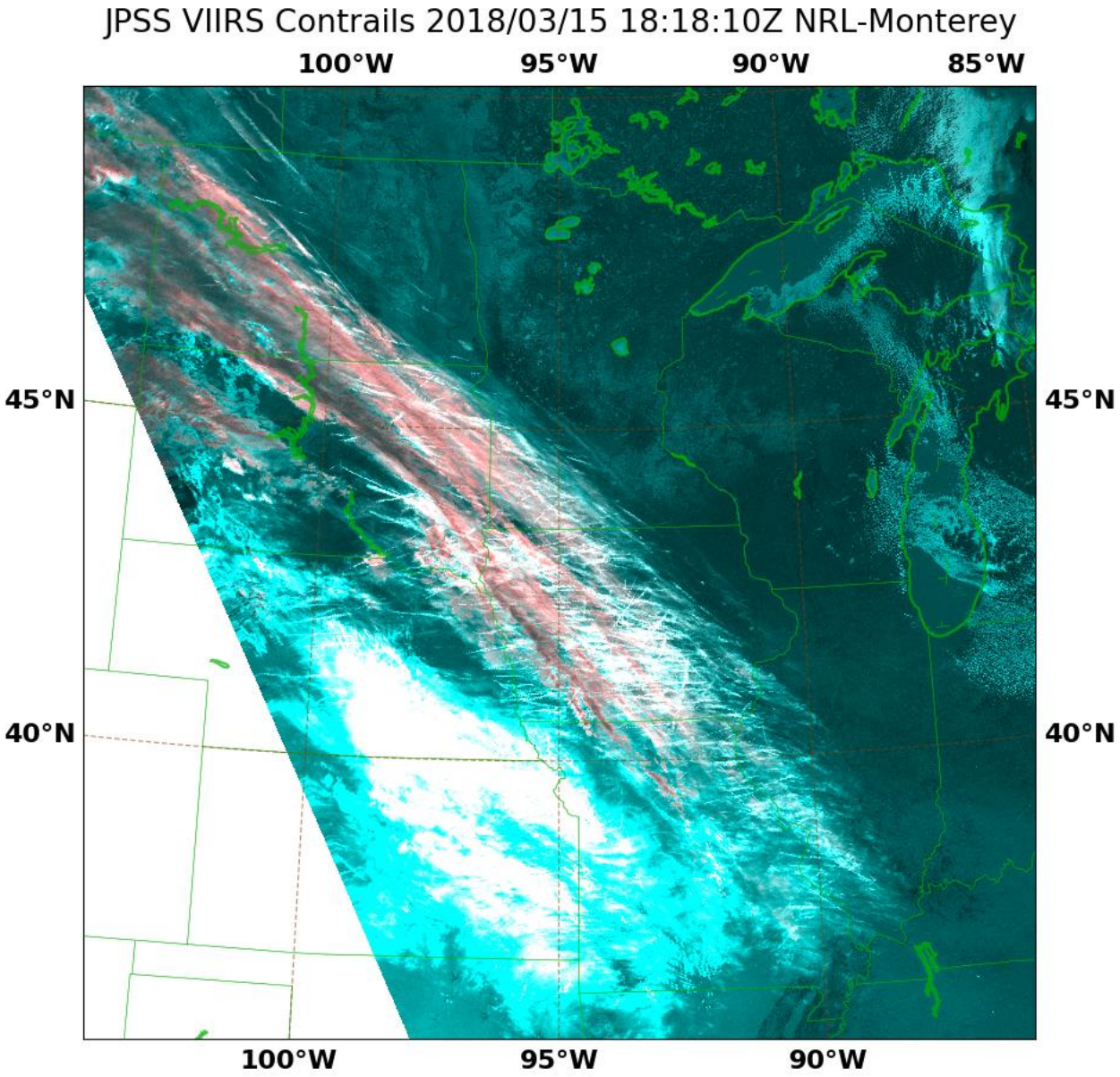
Alaska Direct-Broadcast loop



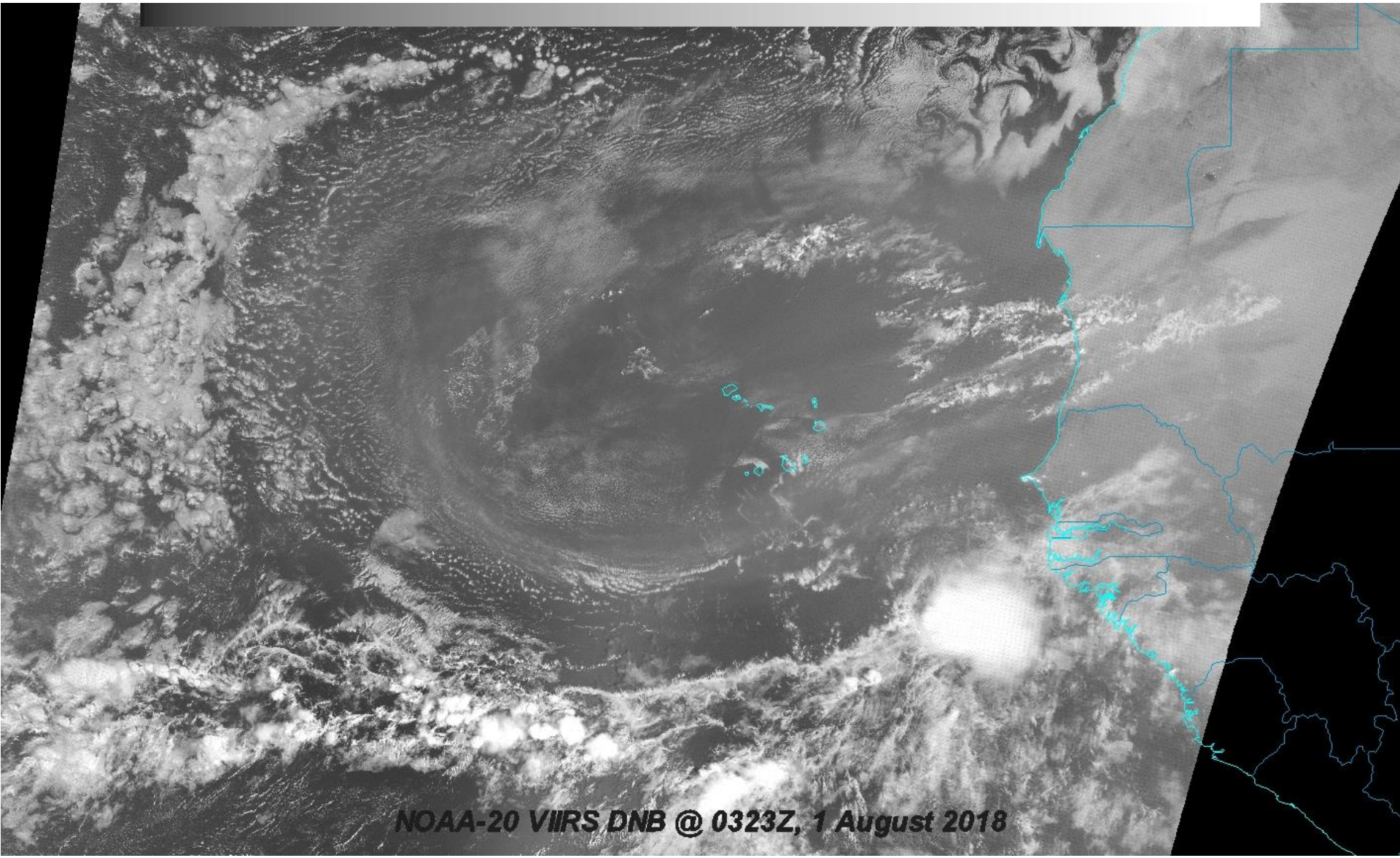
2018-02-07 @ 1106 UTC – Dust across Med (NRL)



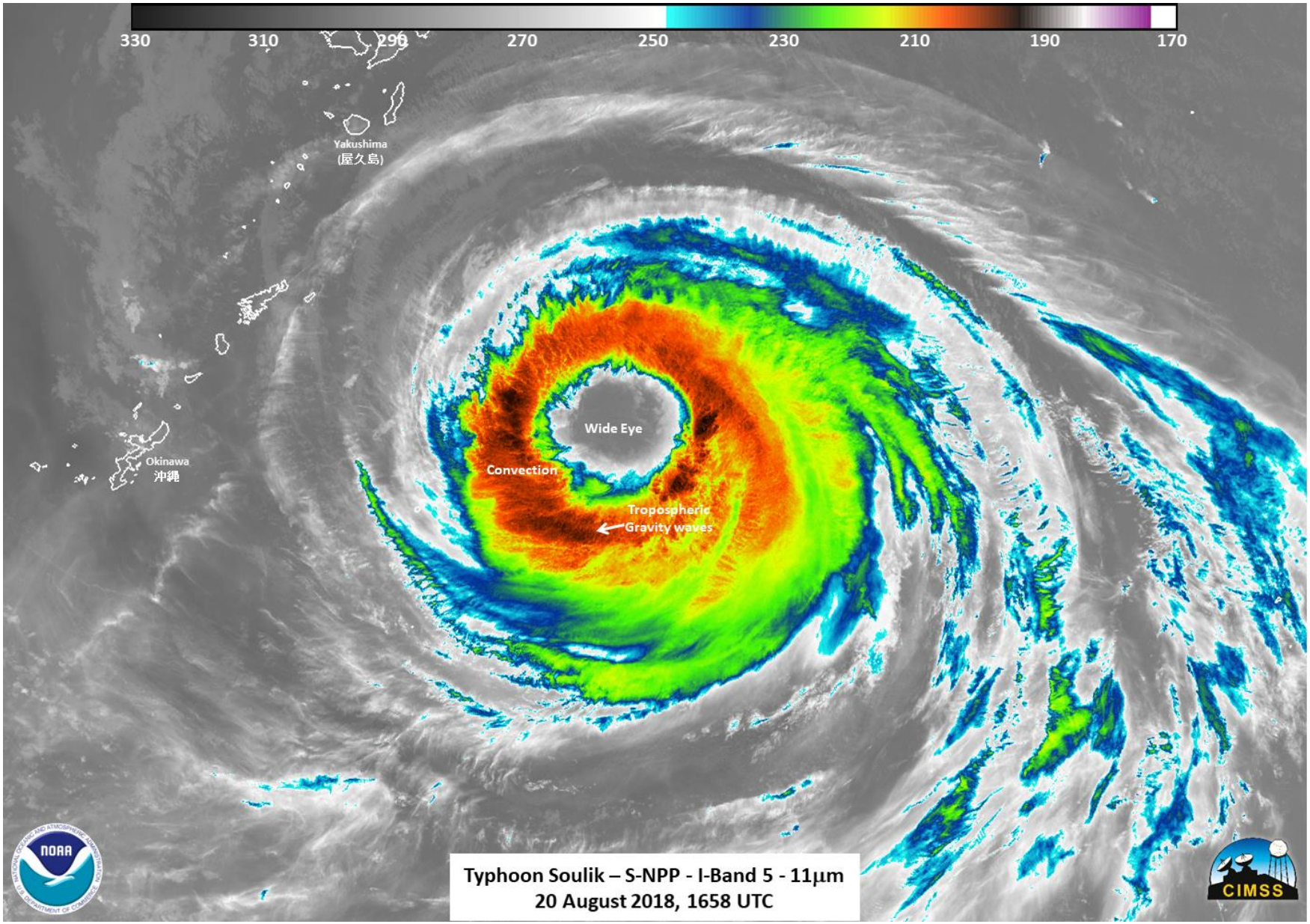
2018-03-15 @1818 UTC – contrails (NRL Monterey)



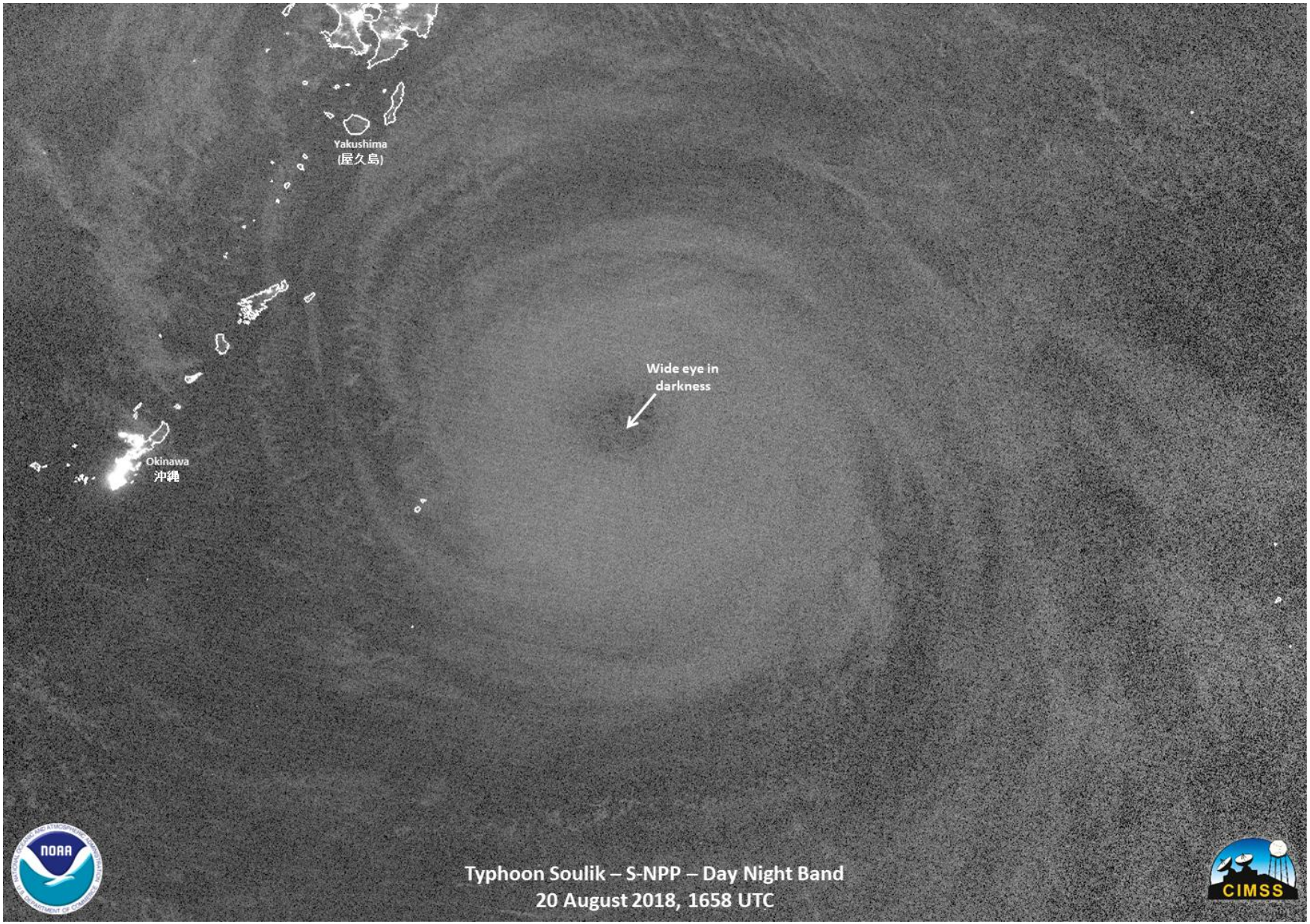
2018-08-01 @ 0323 UTC – NCC dust off Africa (J. Torres)



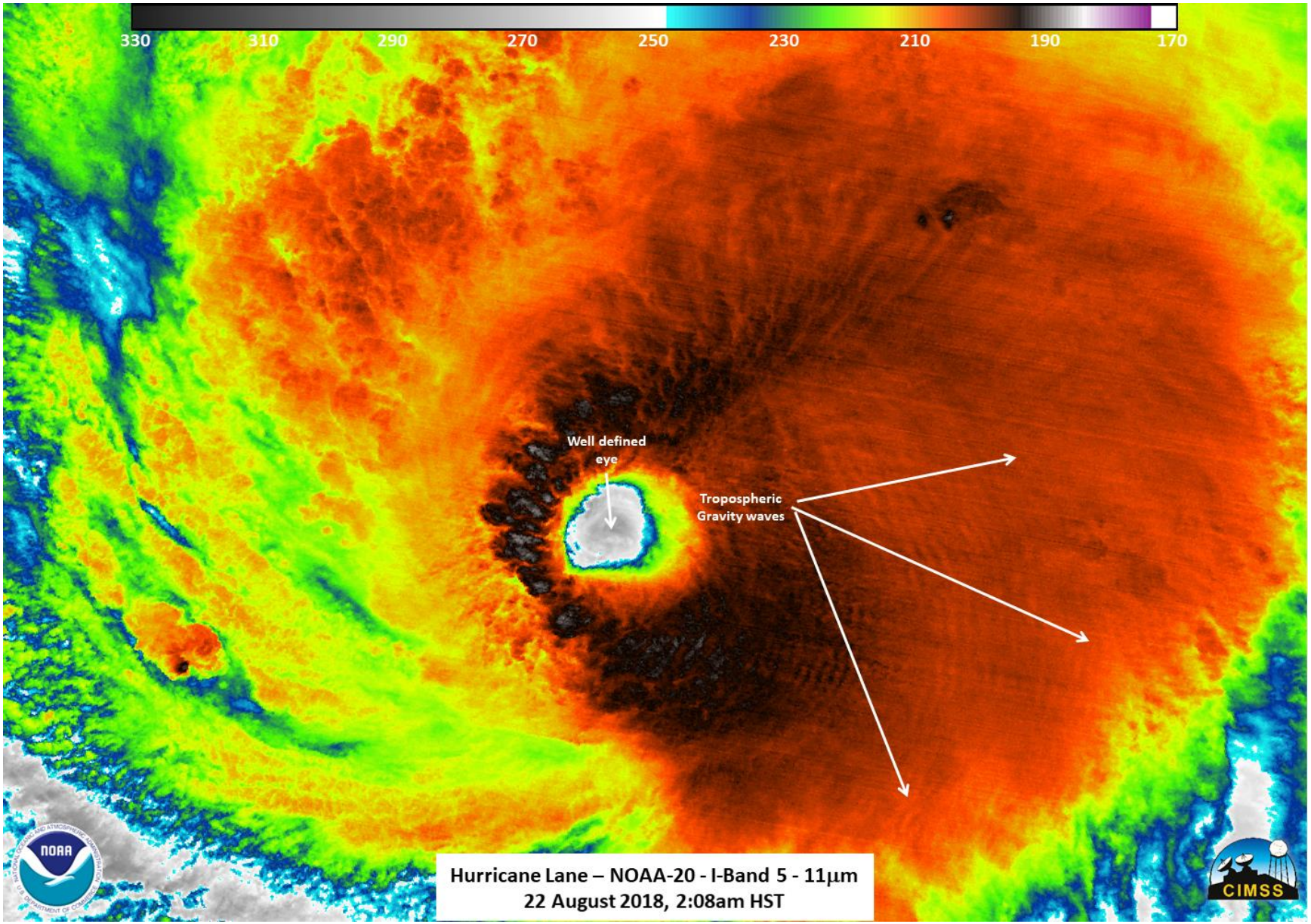
2018-08-20 @1658 UTC – Typhoon Soulik (W. Straka)



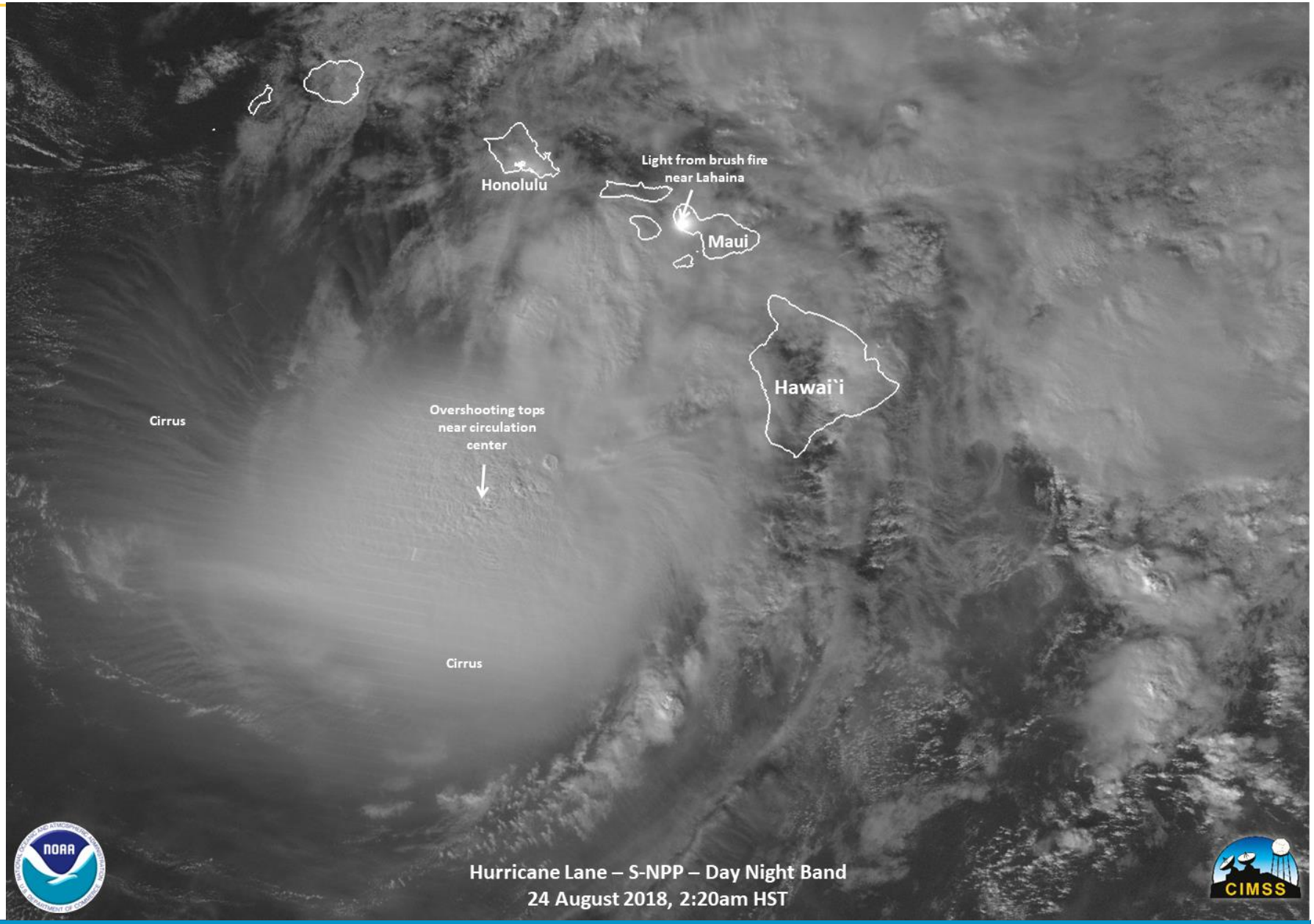
2018-08-20 @1658 UTC – Typhoon Soulik (W. Straka)



2018-08-22 @ night – Hurricane Lane (W. Straka)



2018-08-24 @ night – Hurricane Lane (W. Straka)



Path Forward

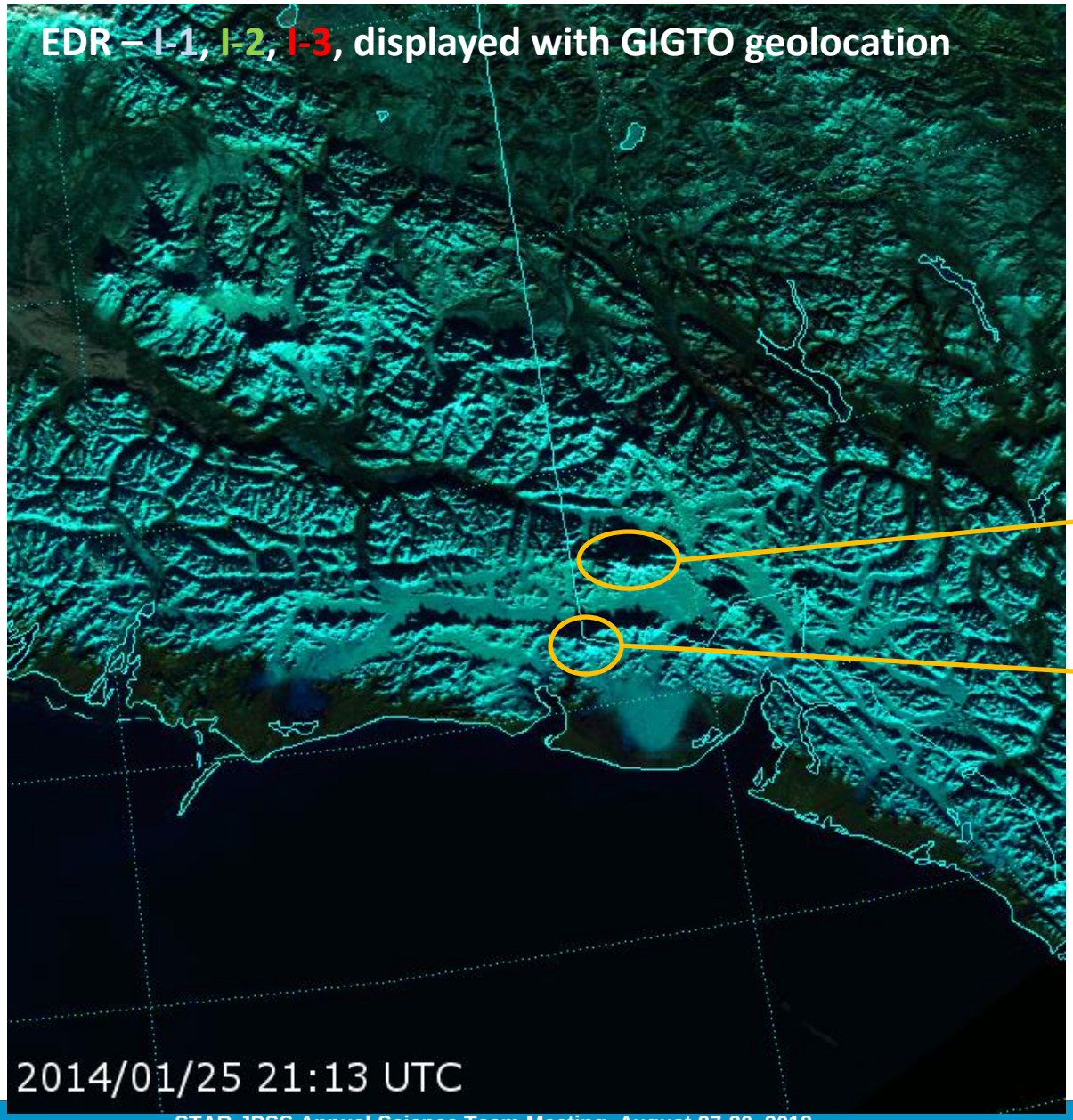
Path Forward (NCC LUT update)

- NCC LUT “Goosey” Table Update:
  - **No** indication that an update is **needed**
  - Will update once for **JPSS-1** (for each satellite)
  - Update **tool/software** has been located, but is currently not installed on **GRAVITE**.
    - **Restore LUT update tool onto GRAVITE**
    - **GVVSSE/”Goosey” LUT update** (March 2019, enabled, but may not be needed)

Path Forward (Terrain Correction for EDRs)

- Terrain Correction for EDR Imagery:
  - Terrain Correction **not** currently available for **VIIRS Imagery EDRs**.
  - **Requested** by VIIRS EDR Imagery users in **Alaska** (in particular)
  - Terrain Correction **required for MX3** (JPSS-2)
  - **Imagery Team** and VIIRS **Geo Team** are working together to address TC implementation
    - ADL testing via Imagery/Geo Team/AIT collaborations
    - Testing finds M-bands are TC “ready” (capable)
    - Need to create necessary GRC_TC file for I-bands and NCC (never part of the processing to date)
    - **Terrain Corrected Imagery EDR code delivery** (Sep 2019)

Imagery **EDRs** are **not** Terrain Corrected!

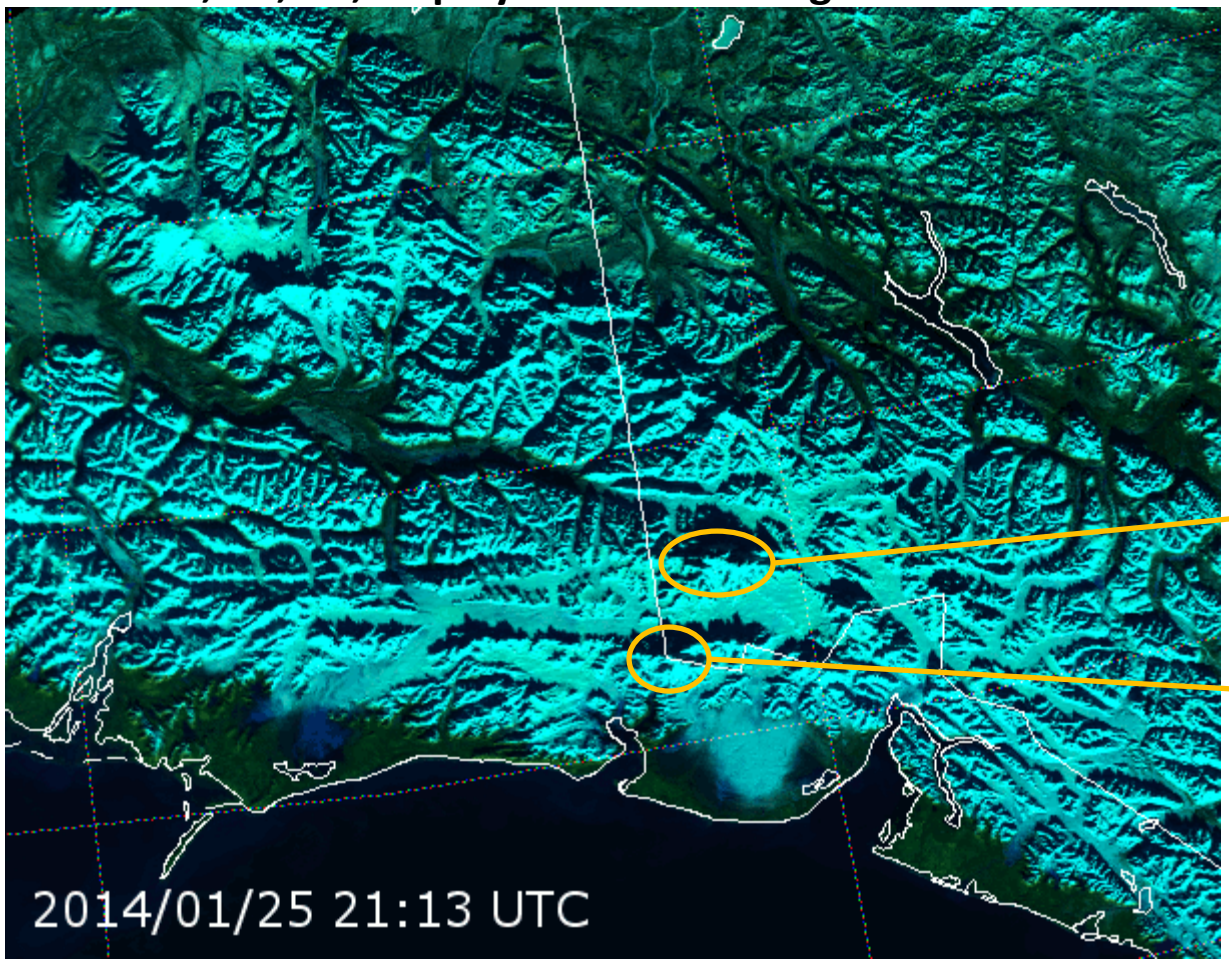


Mt. Logan
(6050 m MSL)

Mt. St. Elias
(5489 m MSL)

Terrain Correction Works for **SDRs**!

SDR – I-1, I-2, I-3, displayed with GITCO geolocation



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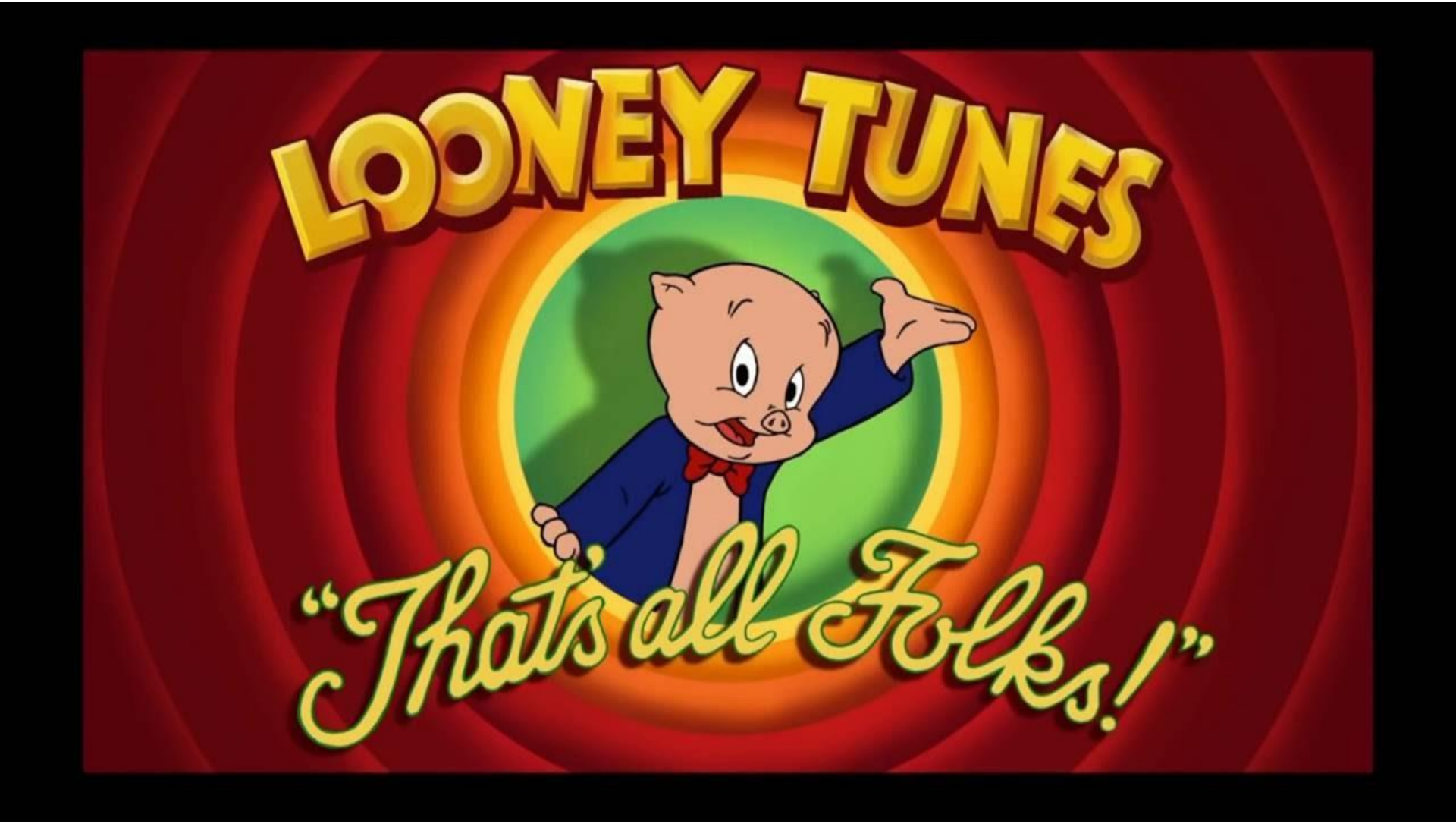
Alaska Users' Presentation
(part of Imagery Validation Review)


LOONEY TUNES
"That's all Folks!"